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IMAGING

Manipulation and Analysis of Gray-scale Images using Image and ImageStudio

Also

"LAPTOPS: A Guide to Portable Computers"

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The Editor
ComputerNews
University of Toronto Computing Services
4 Bancroft Avenue, Room 217
Toronto, Ontario
Canada M5S 1A1

Network address:
phood@vm.utcs.utoronto.ca
(NetNorth/BITNET/EARN)

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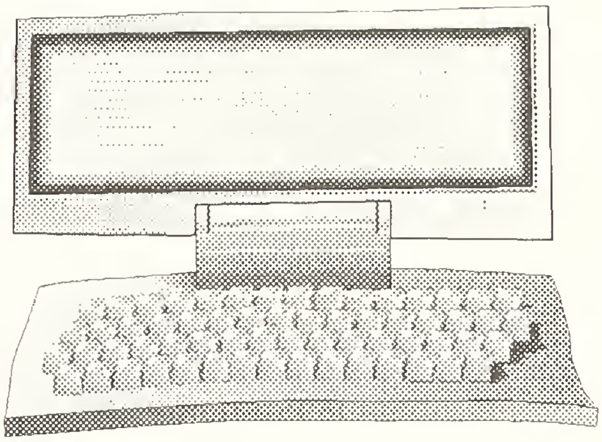
Laptops: A Guide to Portable Computers

Mark Vanderkam

Imagine, if you will, a space shuttle gliding silently through the night sky on the other side of the planet. How does the pilot know her position in relation to the earth? Believe it or not, she uses a laptop computer that is mounted on the dashboard, pressed up against the front window. This computer can be used to determine the shuttle's relative position and, if the main computers that are used for guidance and re-entry were ever to fail, the laptop could be used to guide the shuttle down.

Picture also a television journalist scooping a late-breaking story out in the field, far from the news studio. How does he send the script of his story to the news editors for review and revision before reciting it in front of the camera? Many journalists today use laptops and modems to hook into their network's mainframe computer over telephone lines. They can instantly send text to anyone else who has access to the mainframe, and receive edited copy as soon as it's ready.

As these examples show, people rely on laptops when real computing power is needed in remote places. In the few years since their introduction, laptops have proved themselves to be trustworthy tools that can go wherever people go. For this reason, the laptop market has exploded. In 1986, 5000 units were sold in Canada; analysts predict that this year, one out of every eight microcomputers sold in this country will be a laptop, for a total of 78,000 units. In response to this market demand, vendors such as Toshiba, NEC, Zenith, and Compaq have recently announced a number of new laptops.



Are Laptops *Real* Computers?

Recent models address many of the limitations that have traditionally plagued laptops. For example, laptops with batteries use Liquid Crystal Display (LCD) screens in order to save on power consumption, but the low resolution of most LCDs causes eye-strain. In the last year, a number of laptops with sharp EGA-resolution displays have appeared, and one new model, Compaq's SLT/286, features the first VGA-resolution LCD screen.

Another area of compromise with laptops has been expandability. Most desktop computers have a chassis (usually this is the box under the monitor) that can be fitted with expansion cards. These expansion slots can be used for modems, extra hard disk space, network cards, scanners, CD-ROM players, alternative input devices such as mice and tablets, and so on. Most laptops don't include room for expansion cards because these add weight and bulk, turning laptops into knee-crushers and arm-lengtheners. However, several recent models have expansion units that can be plugged into the laptop. When you go on the road, you simply leave the expansion box behind.

Perhaps the most serious deficiency of laptops has been in computing power. A year ago, you could find only a few models with 80286 processors. Even fewer 80386 models existed. In the last twelve months, however, many well-designed 80286-based laptops have been released, and a few extraordinary 80386-based units have also appeared on the market. Concurrent with this new availability of faster laptops has been the release of fast, large-capacity hard disks for them. This is a significant development: a couple of years ago, very few hard disks were available for laptops. Today you can buy several models that have very fast 100-megabyte (MB) disks.

Which is Which?

There are so many different features for laptops that anybody trying to shop for one can easily become confused (especially by talking to salespeople). The following sections give a summary of many of the more popular models, and of numerous features and how they affect pricing.

Batteries Not Included?

When it comes to power-supply, laptops are of two types: those with batteries and those without. If you plan to use your computer away from an electrical outlet (for example, on a subway or plane, or at a park or construction site) then you need a model with a rechargeable battery. Some units with batteries work for over five hours; many others can hardly survive for two hours on a full charge. Of course, you can always run these units using an electrical socket, even while the battery is charging. Note that you pay for the battery option in two ways: cash and weight. Not only does the battery weigh a pound or two, but you also need to carry a cumbersome AC adapter with you.

It may be more appropriate to call plug-in laptops “slimline portables”: they're not really designed for your lap, since you can usually find a table wherever you can find an outlet. Because plug-in laptops don't have to conserve power as battery-operated models do, they often have features that a battery-powered model could never support. For example, Toshiba has a large number of plug-in models with bright orange gas-plasma screens, which look much better than LCDs. These displays draw too much power to be used with a battery.

For people who travel overseas, another important power-supply issue is the voltage rating of laptops. Many models include a power-supply switchable between 117 volts, which is used in North America, and 220-240 volts, which is the standard in Europe and most of Asia.

Laptops: Comparing Models

Mark Vanderkam

So many laptop models now exist that they're seriously beginning to compete with desk-bound personal computers. Toronto prices for laptops range from $1000 (for Amstrad XTs with marginal screen quality and 512KB of RAM) to over $10,000 (for dazzling Toshiba 386s). The following sections, although in no way comprehensive, evaluate and compare a number of popular makes and models.

386s: Computing Powerhouses

The three most serious contenders for dominance in the small 386 market are Toshiba, NEC, and Zenith. All three companies released advanced 386s last year.

Toshiba's T5200 uses a hardware RAM-cache (32KB) to enhance performance, has an outstanding 100MB hard disk, can accept up to 8MB of RAM, has a VGA display (which is bright orange gas-plasma), and runs at 20MHz. Unfortunately, it can't run on batteries. Dealers in Toronto are selling the T5200 for a little under $10,000 (although its list price is about $17,000). The other major Toshiba 386, the T5100, is an older model that sells for about $7000 in Toronto.

NEC's ProSpeed 386 runs at only 16MHz, but it can run on batteries, can support a VGA external monitor, can hold a 40MB or 100MB hard disk, and sports an impressive black-and-white display. Perhaps the most remarkable feature available for this model is the unique Docking Station. The ProSpeed clips onto this chassis, giving you four full-sized expansion slots and room for a total of 15MB of RAM. The Toronto price for this model is about $8250.

Zenith's TurbosPort 386 comes with a 12MHz processor, 2MB of RAM (expandable to 3MB), a 40MB hard disk, and a CGA “double scan”, page-white, backlit, LCD display. This unit also runs on batteries. Although the Zenith's specifications are not as impressive as NEC's or Toshiba's, this unit will meet many people's requirements. The Toronto price for this model is about $8000.

ATs: Industry Workhorses

The middle of the laptop market, where ATs are sold, is the most exciting and competitive level. Although 386s are more powerful, they're so expensive that most people can only dream about acquiring one; therefore, most people who need powerful laptops shop for ATs with dazzling features.

One such model is the NEC ProSpeed 286, which comes with 1MB of RAM (expandable to 5MB), a choice of 20, 40, or 100MB hard disks, and a VGA-resolution graphics card (although the built-in display is only EGA-resolution). It runs at 16MHz, which is very fast for an AT, and it has a battery. This 14-pound device starts at about $5900.

A machine that has attracted a lot of attention is the Compaq SLT/286, another 14-pound, $5900, battery-powered unit. Compaq is such a major

386s, ATs, and XTs

Once you've decided whether you want the battery option, you need to decide what level of computing power you need. If you have to do high-speed calculations while on a space shuttle or at a multi-million-dollar construction site, then you need a 386 computer, which is currently the highest class of portable available. A 386 is a model based on the Intel 80386 processor. These computers are especially useful when you have heavy processing demands, as with high-level CAD packages and with multi-tasking environments such as Windows/386 and OS/2. Be prepared to pay dearly for these machines. Toshiba's T5200, a 20MHz 386 with 100MB hard disk, VGA display, and two expansion slots, lists for almost $1000 per pound, and it weighs over 17 pounds! (For more in-depth information on 386s, see the article "State of the 386s" in the April issue of *ComputerNews*.)

If your needs are more modest but you must still have the computing punch to handle desktop publishing packages such as PageMaker, packages with graphical interfaces such as Windows/286, or other packages with moderately heavy processor demands, then an AT is probably the machine for you. ATs, which are based on Intel's 80286 processor, first became available in 1984, though the first AT laptop was not announced until 1986. While 386s are more glamorous, ATs are considered by many to be the workhorses of modern industry.

Lowest in computing power are the XTs, which have been around since early 1983 and which are still the most widely used of all personal computers. They're based on Intel's 8086 processor, and generally have less than half the processing power of ATs. Nevertheless, almost all of the over 10,000 programs written for DOS-based computers run on XTs, though they run more slowly than on ATs and 386s. XTs are well-suited for most spreadsheet and word processing programs.

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company that, when it introduced its first laptop in October 1988, it seemed to be telling the world that, indeed, laptops are serious, respectable business tools. The SLT features the most impressive screen ever seen on a battery-powered portable. It also has an exceptionally compact design, measuring a mere 13.5 by 4.2 by 8.5 inches, and supports an optional expansion base that holds two full-sized cards.

If these top-of-the-line models are too expensive for you, there are many less costly alternatives on the market. A notable one that sells for under $3000 is the Samsung S5000. This 11-pound, 10MHz AT comes with 1MB of RAM, a 68ms 20MB hard disk, a CGA-resolution electroluminescent display, and several other features usually found on more expensive models. The educational discount price is about $2500, which is an outstanding price for an AT laptop.

Note, however, that even the Samsung's price is far more than what you'd pay for a comparable desktop AT. For example, the Packard Bell PACKMATE 12, reviewed in the April issue of *ComputerNews*, has a fast 40MB hard disk, a VGA monitor, and compact design, and it sells for less than $2600 in some stores. Portability has a price.

XTs: Computers for Everyone

This class of laptops has a wide range of models, including some of the strangest ones available. A few have features dating back to the dark ages of laptop technology; for example, Bondwell's offering is battery-operated, but it uses a lead-acid battery (instead of the usual nickel-cadmium type) that would damage a lot more than internal circuitry if it ever leaked! However, there are numerous models, available for reasonable prices, that may be all you'll ever need in a computer. For about $1700 you can own an NEC MultiSpeed XT with an electroluminescent screen and two floppy disk drives – the best-selling XT laptop in the US. It runs at a speedy 9.83MHz, which is an improvement on the 4.77MHz speed of many models. The MultiSpeed is also available with a 20MB hard disk for about $3300.

NEC also makes the most compact XT on the market. For $3750 you can own this sleek, black, 4.2-pound shell, which has no moving parts (except for the keys), an expandable, extremely fast 1MB silicon hard disk, and an attractive backlit screen. It fits in a standard inter-office manila envelope and has a number of expandability options.

For those looking for a small XT that's a little less flashy, the Toshiba T1000 may be suitable. It's slow (4.77MHz) and has a merely functional unlit screen, but it weighs only 6.4 pounds, can fit in a small knapsack, and costs as little as $1100 in some stores. Although it has only one disk drive, it has an excellent expansion option that allows for a 768KB battery-backed RAM disk (a $500 addition) that acts like a second floppy disk.

More Checkpoints

When you're shopping for a laptop, another point to consider is expandability. Some models have a port where you can plug in an external keyboard. This feature is useful, because the keyboards on most laptops are somewhat cramped. Most laptops also come with a port for plugging in an external monitor, which is helpful because the LCD screen may cause eye-strain during periods of extended use. Another useful extension is a port for plugging in an external disk drive. (Virtually all laptops use 3.5-inch diskettes, which obviously won't fit in the 5.25-inch drives found in many desktop computers. One way to get around this handicap is to use communications packages such as LapLink or FastWire II, which allow two PCs to be cabled together for quick file transfers.) Of course, you should make sure that the unit you buy also has at least one serial and one parallel port, as these are needed for making connections to printers, modems, mice, and other external devices.

Internal expandability may also be important to you. If you plan to use very advanced applications, make sure the laptop can accept *extra* RAM. Surprisingly, the Zenith SupersPort AT laptop accepts only 2.5MB of RAM. This is more than enough for most DOS-based applications, but it's certainly not enough for many of the new packages designed to run under OS/2. (Experts suggest that OS/2, which can conceivably run with as little as 1.5MB of RAM, may not be able to do anything useful with less than 3MB!) If a modem is important to you, check for internal modem slots. These are available on the higher models, but miniaturized internal modems are generally far more expensive than portable, external units. Many laptops also have a slot for a math coprocessor (an 8087, 80287, or 80387), which is a processing chip that significantly enhances the performance of mathematically intensive applications.

You'll also want to find out what sort of graphics card a laptop has. Before 1988, most laptops were shipped with the capability for only low-level, CGA resolution, an outdated technology first used in 1981. In 1988, many EGA-resolution displays, which are a step up from CGA, became available on laptops. As mentioned earlier, Compaq introduced the first VGA-resolution display in 1989.

Screen Resolution Acronyms

CGA:	Colour Graphics Adapter (640 pixels horizontally x 200 pixels vertically)
EGA:	Enhanced Graphics Adapter (640 x 350 pixels)
VGA:	Video Graphics Array (640 x 480 pixels)

If you're shopping for an AT or a 386, the machine will almost certainly come equipped with a hard disk. The main variables you should be aware of are the disk's capacity and its speed. Most ATs come with a standard 20MB fixed disk, which can hold about 10,000 double-spaced pages of text. That may seem like a lot of space, but most people find that a 20MB hard disk fills up much more quickly than expected; you may need 40MB or more. As for speed, be warned that some hard disks are so sluggish that they can seriously affect the performance of your computer. Hard disks are commonly judged by their access time (the speed with which they access information). An access time of under 25 milliseconds (ms) is regarded as excellent performance, while anything over 70ms is considered unacceptable for a performance-oriented machine.

If you're shopping for an XT, you'll usually have a choice between models with a hard disk and a single floppy disk drive, and models with two floppy disk drives only. Two floppy drives are adequate for programs such as WordPerfect 4.2 or Lotus 1-2-3; a hard disk, however, speeds up your work and makes the manipulation of files easier. An XT laptop with a hard disk usually costs about $1000 more than the same machine with two floppy drives. Note that, on machines with a hard disk, some floppy drives are designed to work with both double-density – that is, 720 kilobyte (KB) – and high-density – 1.44MB – diskettes, while some only allow for 720KB diskettes. The high-density drive is more convenient, because you can fit twice as much data on high-density diskettes.

Finally, some XT laptops give you a choice between electroluminescent (EL) displays and unlit or backlit LCD screens. Unlit LCDs, which are an unpleasant reminder of the early days of flat-screen technology, provide a contrast ratio (the ratio between the lightest light and the darkest dark) of only 3:1, while supertwist backlit LCDs have contrast ratios of up to 12:1. EL displays, generally priced about $200-400 higher than LCDs, provide contrast ratios of up to 20:1, and are the most readable in poor lighting conditions.

Laptops: Quick Points to Ponder Before Purchasing

Geoffrey Rockwell
rockwell@gpu.utcs.ca

If you have to do research in the library, using books that you can't sign out, it makes sense to take a laptop computer. What kind should you buy? This article is based on the comparison shopping I did before buying a Toshiba T1000.

One consideration is weight. With newer models, there's a direct relationship between weight and power: the more powerful the laptop, the more it weighs (and the more it costs). If you plan to carry your computer around regularly, as opposed to taking it to the cottage once in a while, you may want to sacrifice power for lightness. The T1000 that I eventually chose weighs 6.7 pounds. It has only one 3.5-inch, 720-kilobyte (KB) disk drive, but it is truly transportable. Few laptops weigh under 10 pounds.

The weight issue leads to a second consideration. Is this going to be your only computer? That is, are you buying a laptop as an alternative to a desktop computer, or as an adjunct? If you just need something for the library, you'll be more concerned about weight than about power; if you're buying a laptop as your primary computer, you may want a hard drive despite the extra weight.

If you decide to get a light, one-drive laptop, you'll need to find software that takes up minimal disk space. On the T1000 I use PC-Write, a shareware word processor that fits on a single 720KB disk and still leaves lots of free space for documents. It's an adequate word processor, but not the easiest or the most powerful. I don't use only the T1000 for word processing, though; I finish my documents on a Macintosh, so I don't need feature-laden word processing on the laptop. (That's not to say that PC-Write is ineffective. It's surprising how elegant and powerful it is, considering that it's shareware, and small. If you want a copy, call me at 978-4548.)

A third issue is what type of keyboard you want. If you intend to work in an environment where no noise is tolerated, you may want to look at laptops that have "silent" keyboards; however, such keyboards are often uncomfortable for prolonged typing, since many have awkward layouts and poor tactile response. Even with a traditional keyboard, you should pay special attention to its layout and feel, because this is an area where manufacturers may save space and money at the expense of quality. I'm impressed with the T1000's keyboard, which is solid and well designed. It's also noisy: there's a satisfying clack when you punch a key.

Fourth, you should decide whether you need the laptop to be battery powered. Often libraries have sockets to plug your computer into; the Robarts Library has sockets in all its carrels. If you don't have access to an outlet then you'll need a laptop that has a reasonable battery life.

A fifth consideration is screen quality. If the laptop is your only computer, it may be worth investing in a heavier, more expensive machine with a fairly high-resolution display. If you want long battery life then you should look at laptops with non-backlit screens, which are harder to read but use less power.

And, of course, you should consider price. Most super-light laptops are costly; units that are both inexpensive *and* light are seriously underpowered or use nonstandard operating systems. The Radio Shack 102, for example, runs its own built-in software and isn't compatible with anything. Its word processing is inadequate for academic use: what you write is saved on battery-maintained RAM, which is limited to about 15 pages of text. Only with an MS-DOS laptop with a disk drive could academics consider using the laptop as their only machine.

I'm presently satisfied with the Toshiba T1000. It's well designed, costs just under $1000, has a nice feel, and weighs under 10 pounds. It seems that no other laptop combines these virtues. On the other hand, I use it only for taking notes and writing rough drafts. It may not be acceptable to some as their sole computer.

Image

Terry Jones
tj@vm.utcs.utoronto.ca

Image is a Macintosh application that allows manipulation and analysis of gray-scale images. The following is a modified extract from the documentation provided with Image, describing a few of its capabilities.

Introduction

Image is a public domain application for doing digital image processing and analysis. It can acquire, enhance, measure, edit, animate, print, and pseudo-colour images. It reads and writes TIFF and PICT files, providing compatibility with many other Macintosh applications including ImageStudio, PixelPaint, and Digital Darkroom. Image supports many standard image-processing functions including histogram equalization, contrast enhancement, density profiling, smoothing, sharpening, edge detection, and noise reduction. It can measure lengths and x-y coordinates, and compute the average density and area of user-defined regions. Length and area measurement results can be calibrated to provide real-world values.

Density calibration can be done against optical-density or radiation standards, with any user-specified units. The user can select from eight curve-fitting methods for generating calibration curves.

Image provides MacPaint-like editing of colour and gray-scale images, including the ability to create lines, rectangles, ovals, and text. It can flip, rotate, invert, and scale selections. It supports multiple windows and eight levels of magnification. All editing, filtering, and measurement functions operate at any level of magnification and are undoable. Image uses digital half-toning to print on PostScript printers and Floyd-Steinberg dithering to print on non-PostScript printers.

Image supports either the Data Translation QuickCapture card or the Scion Image Capture 2 card for digitizing images using a TV camera. Acquired images can be shading-corrected and frame-averaged.

System Requirements

For full operation, Image requires a Mac II with at least two megabytes (MB) of memory, but 4MB or more is recommended for doing animation, for simultaneously displaying more than a handful of pictures, for running under MultiFinder, or for doing frame averaging. Image also requires an eight-bit Video Card capable of displaying 256 colours or shades of gray. Image supports film recorders, graphics tablets, PostScript laser printers and phototypesetters, and the Tektronix Color Printer.

Supported Image File Formats

You can open three types of files:

1) Four-bit and eight-bit gray-scale TIFF files created by many other Mac applications, including ImageStudio, Digital Darkroom, and numerous scanner programs. TIFF files that were created on another system, such as an IBM PC, usually need to be opened using the Import command.

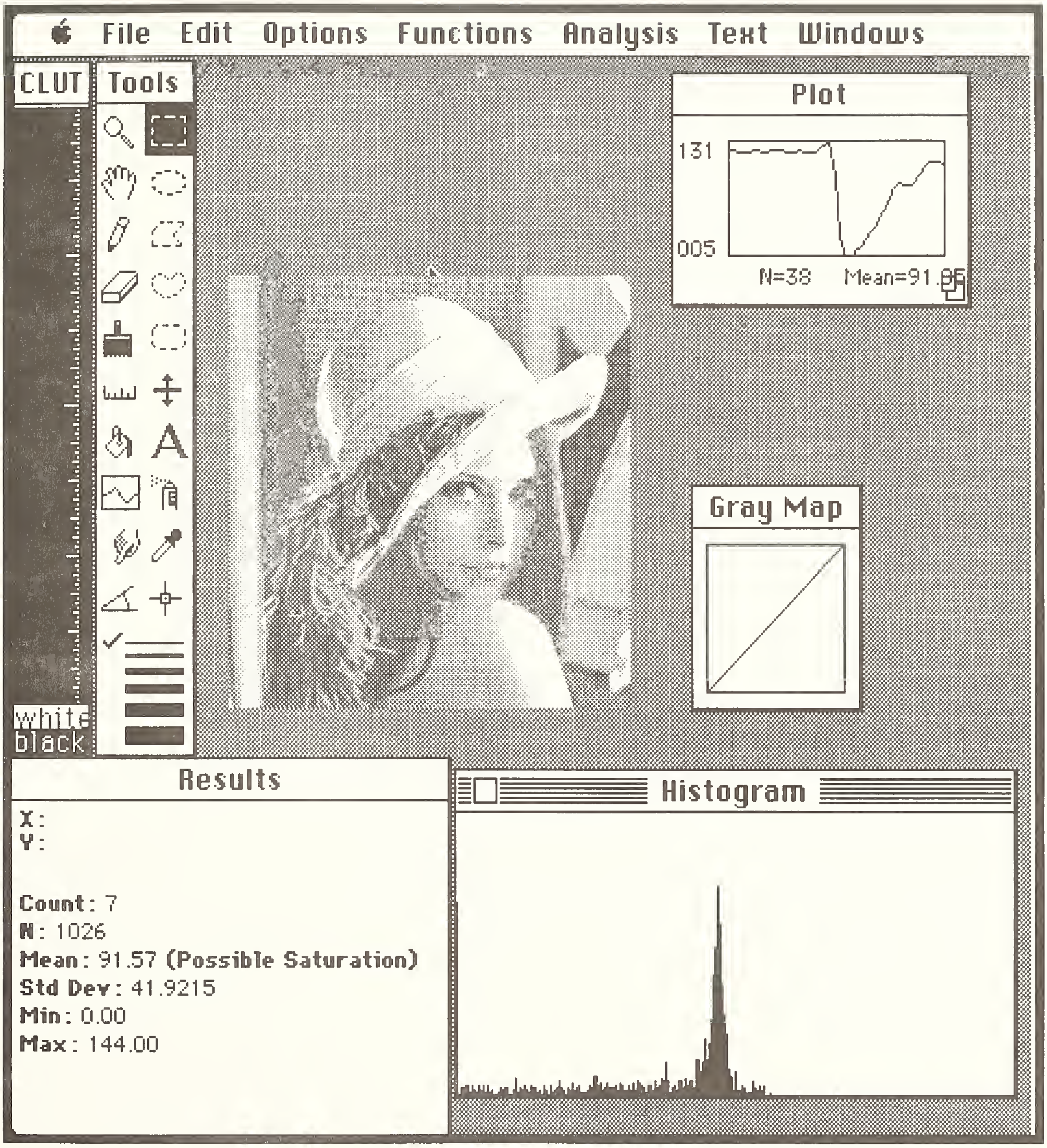
2) PICT files created by many Mac applications, including MacDraw, Digital Darkroom, and PixelPaint.

3) The Image Picture File Format (IPIC), which is unique to Image. (In newer releases of Image, IPIC format has been replaced by TIFF; thus, IPIC files can now be read but not written, and can be saved as TIFF files.)

Import

The Import command can be used to read image files created by non-Macintosh-based systems. It supports three types of files. Select **TIFF** if you want to open a TIFF file that was imported from another system, such as an IBM PC; select MCID to open files created by the IBM-PC-based **MCID** image-analysis system from Imaging Research; select **Custom** to open any other type of eight-bit image.

Since Image is in the public domain, you are welcome to copy it. For more information about Image, or to obtain a copy, contact Terry Jones at 978-4924.



Results

```
X:
Y:

Count: 7
N: 1026
Mean: 91.57 (Possible Saturation)
Std Dev: 41.9215
Min: 0.00
Max: 144.00
```

Screen view of Image in action

ImageStudio 1.5: Much More than MacPaint!

Michael LeBlanc
mleblanc@vm.uoguelph.ca

(On Wednesdays, Michael LeBlanc is a Lecturer in the Department of Art as Applied to Medicine, Faculty of Medicine; on Thursdays, he works as a Graphic Designer in the Text and Imaging Group at UTCS.)

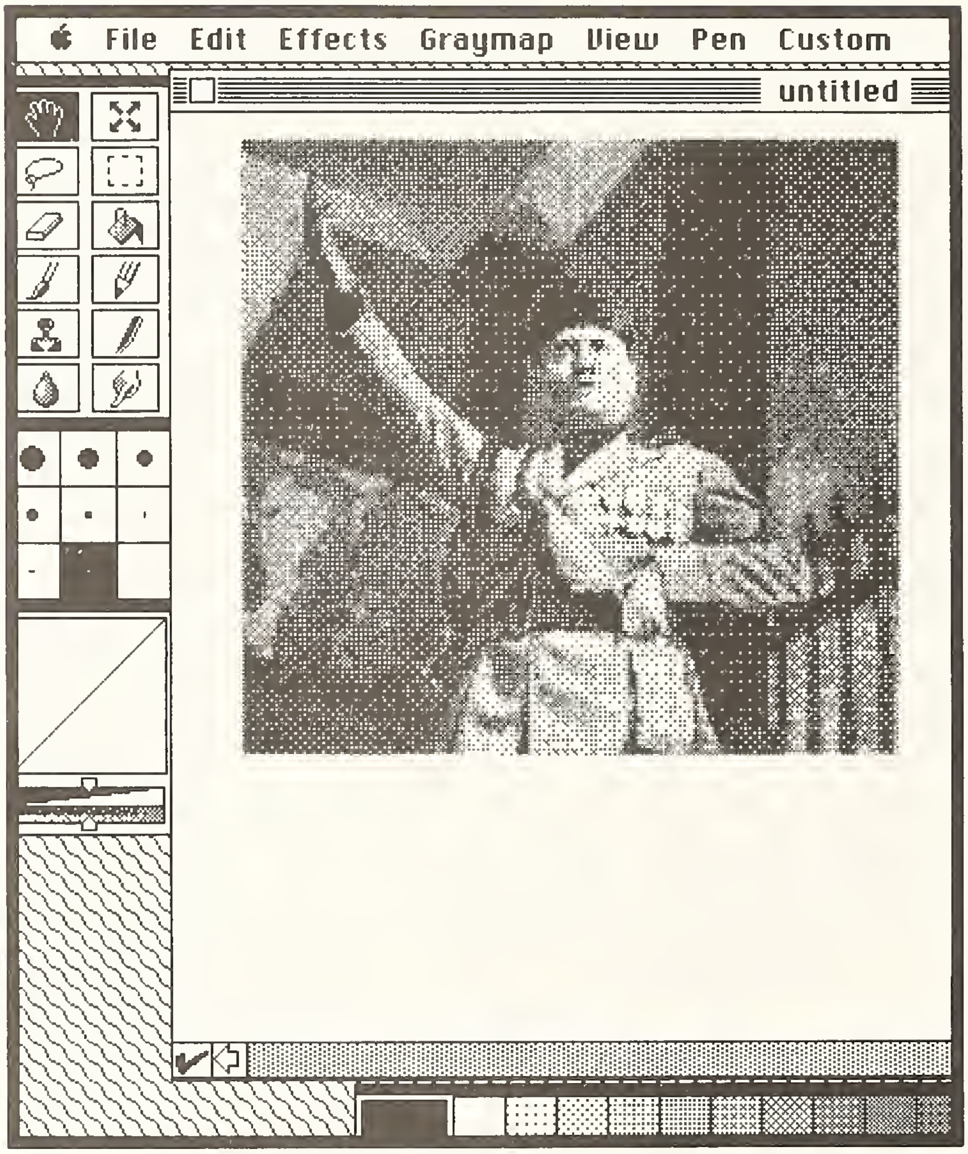


Figure 1: An ImageStudio screen showing the menu items and (from top left, working down) the Tool Palette, Tool Sizes, Graymap Editor, and Shade Palette.

Introduction

In 1984, when the Macintosh was first introduced, there was nothing in the world like MacPaint. Now, five years later, Bill Atkinson's ingenious interface has been copied and ported over to other types of computers. But it is no longer the graphic state-of-the-art it once was; new graphics programs with added functionality have appeared. ImageStudio is one of the new breed.

Distributed by Letraset, ImageStudio is a black-and-white, gray-level image-editing program for the Macintosh. You can use it to touch up scanned pictures or to combine images, or as a powerful black-and-white paint system.

Importing Images

ImageStudio was intended as an "image enhancer"; thus, it assumes that the user has access to a digital image scanner such as the DEST or HP ScanJet. Most scanners allow you to save your image in TIFF format, which ImageStudio accepts. For best results, scan your image at 100 dpi maximum, in grayscale format. ImageStudio can also import MacPaint, PICT, and ThunderScan pictures.

The designers devised a new image format, which they call RIFF (Raster Image File Format). A picture saved in this format is smaller than in TIFF, but it has the same quality. When you save a file after an ImageStudio session, you would normally save it as a RIFF file, but you also have the option to save the image in MacPaint, TIFF, PICT, or Encapsulated Postscript format.

Although ImageStudio will work on a Mac Plus, it really shines when it runs in grayscale with an 8-bit colour card. In this mode, the screen image looks almost photographic.

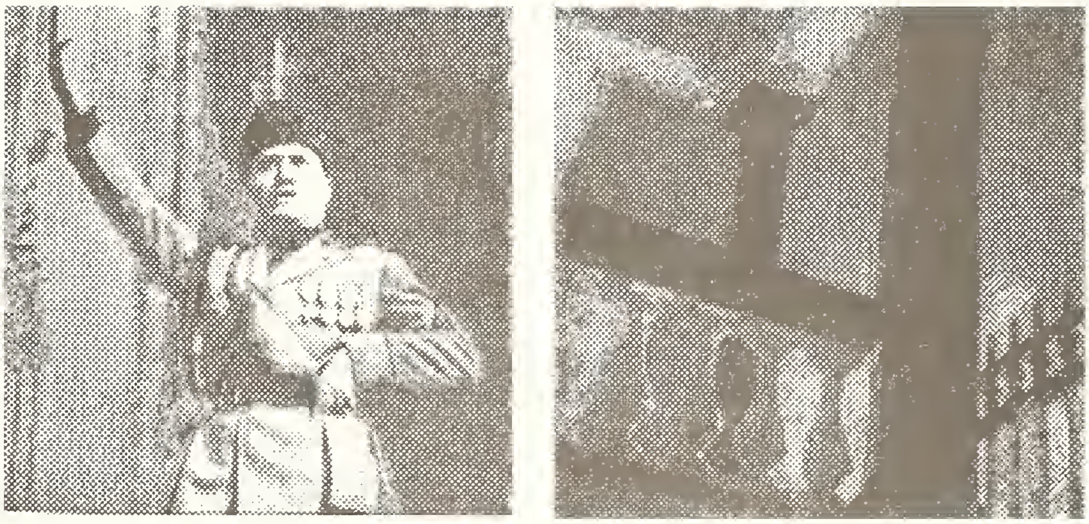


Figure 2: A typical job for ImageStudio might involve improving the background of a single figure. Using ImageStudio, the user would combine the two images by cutting the figure out of the image on the left and pasting it over the picture on the right.

The Drawing Tools

Even without a scanner, ImageStudio is capable of astounding visuals. The drawing tools, such as the Pencil, Brush, and Paint Bucket, work similarly to MacPaint's, but with added functionality (see *Figure 1*). For example, the brush marks are soft around the edges, as though you are painting on blotting paper, and the Paint Bucket can supply such patterns as graduated shades or circular graduated shades.

There's also a Charcoal tool to build up a shade slowly, and a Rubber Stamp tool to enable you to pick up a small area of your picture and draw with it.

The Editing Tools

Also reminiscent of MacPaint are the selection tools – the Lasso and the Marquee. Functions have been added to the Lasso that make it much more powerful. You can now select more than one separate, irregularly shaped object concurrently, and you can add to an irregular selection or subtract from it. This feature is especially helpful if, for example, you need to darken a number of irregular objects equally.

The Marquee has the power to enhance your pictures using ImageStudio's filters. You can sharpen, blur, soften, or trace the edges of a selected area. If you need to convert your picture to MacPaint format, you can preview the dithered result by selecting the image with the Marquee and then choosing Show MacPaint Dither from the menu.

Two instruments which will be unfamiliar to MacPaint users are the Fingertip and the Water Drop, both of which are necessary additions for retouching. The Water Drop tool blends shades together; the Fingertip smudges shades.

No retouching software would be complete without the ability to lighten, darken, or change contrast. Sliders control brightness and contrast, and the Gray Map allows you to alter the transfer characteristic of the grays used in your image. You can perform a reversal (e.g., draw the diagonal in the opposite direction) or a digital solarization (e.g., draw a wave shape in the editor box).

Customizing ImageStudio

ImageStudio's greatest strength is its ability to create custom features. The Pen Menu and the Custom Menu allow you to customize ImageStudio

Figure 3: ImageStudio can enhance all types of propaganda. In the same way that editing of news footage can change the audience's interpretation of a news story, so single images can be edited to emphasize certain ideas or even to mislead the viewer. While a discussion of photo-retouching ethics is beyond the scope of this article, it is apparent that such issues must be addressed in the future.

to suit your needs. You can choose from a list of sixteen pen tip shapes, or you can create your own shapes. By drawing a shape with different levels of gray, you can control how dark each pixel in the shape will be.

You can also create special tools and save them under the Custom Menu. Because each ImageStudio tool has variable settings underneath it (just double-click on its icon), you can define, for example, a new brush that will draw only on shades lighter than itself.

Exporting ImageStudio

In addition to saving files in native RIFF format, you can save your pictures as PICT, TIFF, or Encapsulated Postscript (Mac and MS-DOS) files. When you save in Encapsulated Postscript, the program warns you that you cannot reopen a file saved in this format.

For altering existing photographs, combining images in new ways, or painting a picture from scratch, ImageStudio is an easy-to-learn, easy-to-use program. It will work on a Mac Plus with two disk drives, but a Mac II with a hard disk and an 8-bit video card is recommended.

ImageStudio 1.5 is available at the U of T Computer Shop for $199.95.

Information Centre Talk

Reinhard Schuller
schuller@vm.utcs.utoronto.ca

Again this academic year, to keep you abreast of the latest developments in information technology, the UTCS Information Centre will be offering talks to faculty members, graduate students, and staff. We provide a wide range of services and we'd like to tell you about them. Your interests may be as diverse as connectivity issues, desktop publishing, electronic mail, or word processing. Or you may want to find out which language and statistical products UTCS has site licenses for. We can help you acquire the computer skills and information you want.

Talks can be tailored to your particular needs. To arrange for UTCS staff to talk to your group or department, please contact Reinhard Schuller at 978-6878.

Microcomputer Courses

Irene Rosiecki
rosiecki@vm.utcs.utoronto.ca

UTCS offers various noncredit microcomputer courses to faculty, staff, and graduate students of the University of Toronto. These courses cover a number of applications available for the PC or the Macintosh. Whether you will be typing a thesis using a word processor, or working with spreadsheets, databases, or desktop publishing, we may be able to help you get started.

Our class sizes are small to allow for much individual attention. Continuing support is available upon completion of the course.

The following is a list of the microcomputer courses taught at UTCS:

Introduction to dBASE IV
Introduction to Desktop Publishing
Introduction to Disk Operating System (DOS)
Electronic Mail Seminar
Excel on the Macintosh
Introduction to HyperCard
Introduction to Lotus 1-2-3
Introduction to PageMaker
ProComm Communications Seminar
Introduction to SAS on the PC
Intermediate Applications of SAS on the PC
Microsoft Word on the Macintosh
Microsoft Word on the PC
Introduction to WordPerfect 5.0
Advanced WordPerfect 5.0 Topics
Introduction to WordPerfect 5.0 for 4.2 Users

To find out about registration procedures or to book a place in any of these courses, please contact Irene Rosiecki at 978-4565. Courses are filled on a first-come, first-served basis. The more popular courses fill up quickly, but waiting lists are maintained in case of cancellations.

Numerical & Scientific Software for Microcomputers

Andrzej Pindor
apindor@vm.utcs.utoronto.ca

Newest Release of NAg Library, Mark 13, Installed on VM/CMS System

Until recently, the NAg FORTRAN Library available on VM/CMS was release Mark 11. (Successive releases of the NAg Library are referred to as Marks, with successive numbers.) In June, the NAg Library Mark 13 was installed on the UTCS VM/CMS system. This newest release has a considerable number of differences in comparison with Mark 11, since some systematic revisions were made to the Library software between Mark 11 and Mark 12. Mark 13 consolidates the various innovations that were introduced in Mark 12, without introducing any further significant changes to the design of the Library.

The changes between Mark 11 and Mark 12 that may be noticeable to users include the following:

- the transition to FORTRAN-77;
- a modified error-handling mechanism;
- revision of all example programs;
- inclusion of two sets of BLAS in a new chapter named F06;
- inclusion of option-setting routines and setup and diagnostic routines to simplify calling sequences;
- a simplified structure for routine documents.

One hundred and seventy-five new routines were included in the NAg FORTRAN Library in Mark 12. Ninety-seven of these were included in the new chapter F06. Twelve routines were withdrawn. There were also revisions to optimization routines and to the routines for solving initial value problems for stiff systems of O.D.E.'s.

Mark 13 contains a total of 746 user-callable routines, 91 of which are new in this Mark.

New or improved facilities are provided (in designated chapters) for:

- roots of polynomials (C02);
- symmetric or two-dimensional FFT's (C06);
- adaptive one-dimensional quadrature (D01);
- initial value problems in O.D.E.'s (Adams and Runge-Kutta-Nystrom methods) (D02);
- elliptic P.D.E.'s (D03);
- monotonicity-preserving interpolation (E01);
- interpolation of scattered data (E01);
- curve and surface fitting by splines with automatic placement of knots (E02);
- real and complex singular value decomposition (F02);
- complex QR factorization (F01);
- condition estimation (F04);
- solution of almost block diagonal systems of linear equations (F01, F04);
- discrete statistical distribution functions (G01);
- robust statistical estimation (G02, G07);
- diagnostic checking of fitted time-series models (G13);
- Bessel, Hankel, and Airy functions of complex argument (S).

In addition, chapter F06 – Linear Algebra Support Routines, which was introduced in Mark 12 – has been enlarged by an addition of 30 new routines for matrix operations, most of them concerned with the application of sequences of plane rotations.

A number of routines have been revised to improve accuracy, robustness, and reliability, and to provide explanatory error messages.

In order to access the NAg Library Mark 13, users should issue this command:

```
GETME NAG NEW
```

The disk containing the NAg Library Mark 13 has a number of files on it. Files with the filetype DOC contain information that users may find useful:

- ESSINT DOC — the Essential Introduction to the NAg FORTRAN Library;
- SUMMARY DOC — a brief summary of the routines;
- CALLS DOC — a list of routines called directly or indirectly by each routine in the Library, and by each example program;
- CALLED DOC — a list, for each routine in the Library (including auxiliaries), of those routines and example programs which call it directly or indirectly.

Example files have the form EXPTnnn FORTRAN, EXPDnnn DATA, and EXPRnnn RESULTS, where nnn stands for the chapter to which the examples refer. The filetypes identify in an obvious way the source code, input data, and expected results. Within each file, programs (or, correspondingly, data and results) for specific routines are preceded by records of the form *A<name> and terminated by records of the form *Z<name>, where <name> stands for the name of a specific routine. Thus, for example, a program that tests routine F02AFF starts with record *AF02AFF and ends with record *ZF02AFF. Within each chapter, routines are arranged alphabetically.

File NAGLIB TXTLIB contains the NAg Library, and its filename has to appear on the GLOBAL statement; that is, to link to the NAg Library Mark 13, you have to issue one of the following GLOBAL statements:

In LINK mode:

```
GLOBAL TXTLIB VLNKMLIB VFORTLIB CMSLIB NAGLIB
```

or

In LOAD mode:

```
GLOBAL TXTLIB VFORTLIB CMSLIB NAGLIB
GLOBAL LOADLIB VFLODLIB
```

Users interested in examining documents relating to the NAg Library Mark 13 (for instance, to obtain a more detailed description of the changes with respect to Mark 11) should call Andrzej Pindor at 978-5045.

NAg Workstation Library at UTCS

The SNAC Group at UTCS has acquired the NAg Workstation Library for our Zenith-AT microcomputer. The NAg Workstation Library is a subset of the NAg FORTRAN Library Mark 12, consisting of 172 routines broadly covering the principal areas of mathematics and statistics. The version we have acquired is compiled under Microsoft FORTRAN 4.0.

The routines of the Library are divided into the following chapters:

Zeros of Polynomials	-	1 routine
Roots of one or more transcendental equations	-	2 routines
Summation of series	-	5 routines
Quadrature	-	5 routines
Ordinary differential equations	-	10 routines
Curve and surface fitting	-	12 routines
Maximizing or minimizing a function	-	8 routines
Matrix operations	-	5 routines
Eigenvalues and eigenvectors	-	14 routines
Simultaneous linear equations	-	12 routines
Simple calculations on statistical data	-	14 routines
Correlation and regression analysis	-	8 routines
Random number generators	-	25 routines
Nonparametric statistics	-	6 routines
Time series analysis	-	7 routines
Sorting	-	2 routines
Approximations of special functions	-	31 routines
Machine constants and utilities	-	5 routines.

Interested users are welcome to try out the Library routines after first making an appointment with Andrzej Pindor (978-5045).

MathCAD News

MathSoft has recently announced the availability of a new version of MathCAD: Version 2.5. This new version includes three-dimensional plots, output to PostScript printers (including the Apple LaserWriter), and import of HPGL files from AutoCAD and other packages. MathCAD 2.5 also includes matrix sort functions, and block cut-and-paste for multiple regions. For improved ease of use, MathCAD 2.5 includes pop-up menus for plotting, for numerical formatting, and for sketch import. Version 2.5 is completely compatible with, and loads all files created by, MathCAD 2.0. More accurate transcendental functions, as well as numerical algorithms for improved integration, have also been included. (For a detailed review of MathCad Version 2.0, see the January/February 1989 issue of *ComputerNews*.)

The new version of MathCAD costs US$495, but present owners of MathCAD 2.0 can upgrade to 2.5 for US$149. For owners of MathCAD 1.1, the price of upgrading to 2.5 is US$175.

Anyone interested in examining the new version of MathCAD is welcome to come to UTCS and do so, but should first contact Andrzej Pindor at 978-5045.

WATCOM C Version 7.0

Reinhard Schuller
schuller@vm.utcs.utoronto

UTCS has renewed its university-wide site license for the WATCOM C Compiler, which is available to university members for a $35 annual license fee. Payment must be made from University research funds. The complete package consists of nine 360-kilobyte (KB) diskettes that run on the IBM PC and PS/2 with DOS. Manuals are available from the UTCS Information Office.

The package includes two compilers: the WATCOM C Optimizing Compiler and the WATCOM Express C Compiler. Both compilers and their associated libraries are compatible with the proposed ANSI standard. Also included are the WATCOM Editor, WATCOM C Library, WATCOM C Graphics Library, and WATCOM Debugger.

In the package, there are also a number of tools: make, touch, a patch utility, a strip utility, an object file disassembler, a library manager, and the WATCOM C Preprocessor. The "make" tool is useful in program development; it ensures, based on predefined rules and dependencies, that files are not out of date. The "touch" tool, which is used together with "make", sets the modification date and time of files to the current date and time. The patch utility is used to apply bug fixes to WATCOM C and its associated tools. The strip utility removes the debugging information from an executable file so you do not have to remove the debugging directives from the linker. The object file disassembler takes as input an object file and produces as output the Intel assembly equivalent; this tool can be used to generate an assembly-language listing from object files, since the compiler does not produce such a listing. The WATCOM C Preprocessor, by producing output source files with the macros expanded, allows you to see the actual code that the compiler would compile.

The installation is straightforward. If you choose all of the options, you will need about three megabytes of disk space. You have the choice of installing any of five memory models — small, medium, compact, large, and huge — depending on your requirements for code and data size. Also, floating point (80x87) library support is available. Demo programs are provided to test the graphics library and both compilers. The installation procedure creates files containing lines that can be added to the autoexec.bat and config.sys files.

The Optimizing Compiler provides a compile command (WCC) and a link command (WLINK), as well as a single compile-and-link step (WCL). Each of these commands has numerous options. The compile options include debugging information, memory model, and optimization control; the link options and directives include files to be linked, libraries to be searched, debugging information, and overlay file control. The linker also accepts a directive file, so you need only type a filename at the command line.

WATCOM C Express (WCEXP) is a one-step compile-and-link compiler. It supports the medium memory model only (that is, data up to 64KB and code limited only by machine memory). The compiler can be invoked from the command line or configured as an edit and compile-run environment with the WATCOM Editor. The Editor and compiler are completely memory resident, and by using the Editor's RUN command, you can compile and execute a C program in the Editor's workspace. Control is then passed to the Editor. This integrated environment makes the testing and modifying of programs easier. The Editor comes with a help facility and supports a mouse.

Both compilers provide very good debugging facilities. The Express C Compiler has an integrated source-level debugger. It is able to set break points, trace program execution, and examine and modify variables. The debugger is a window environment with pull-down menus; you can open windows to see the program, output, and data. Though not documented, mouse commands will generally work. The C Compiler Debugger (WVIDEO) can trace program execution at the source or at assembly-language level, allow you to define your own debugging commands through debugger command files with replaceable parameters, and suspend execution when a particular instruction is reached, a memory location is modified, or a condition is satisfied. WVIDEO is a feature-rich debugger with mouse- or keyboard-activated windows, and it supports two monitors simultaneously. The longest chapter (over 120 pages) in the Optimizing Compiler Manual clearly explains the debugger's use.

We did not do any benchmark testing, but independent sources have shown that the WATCOM C Compiler produces fast, tight code. Although it currently does not support Microsoft Windows or OS/2 and cannot produce 80386 instructions, it was rated the compiler of choice by one of the trade magazines.

The WATCOM product is an exceptional package for the serious development of C programs. Anyone who would like further information or is interested in obtaining a copy can call Reinhard Schuller at 978-6878, or Advising Services at 978-HELP.

UTCS Apple Care

Now Available at the new Authorized UTCS Apple Repair Centre, 4 Bancroft Avenue, Room 103.

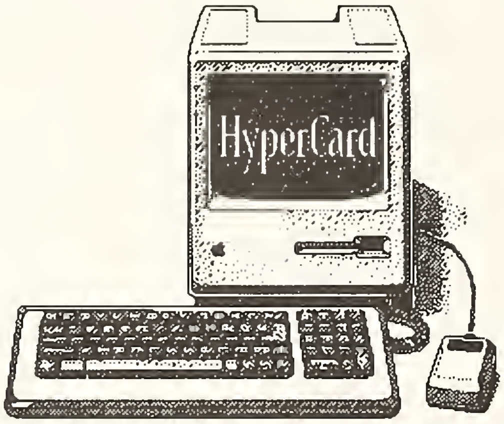
Maintenance contracts, repairs, & upgrades for Macintosh computers and Apple Printers.

On site or Depot Servicing
Please Call: *978-6486*
978-5050

Also Available:

Maintenance contracts repairs and upgrades for IBM PCs and compatibles and Printers.

HyperCard Seminar



Many people have been asking about HyperCard – What is it? Should they be interested? For those who wish to learn this package, UTCS has developed an introductory seminar on HyperCard and its capabilities. The seminar will cover basics only, with Participants learning to create and modify simple stacks. It is suitable as preparation for the more advanced HyperCard course offered by Apple's ARPP program here at U of T.

For dates and times call Irene Rosiecki at 978-4565.

To register in the seminar, please call Irene Rosiecki at 978-4565. For more information about the seminar's content, please contact John Bradley at 978-3995.

Documents at UTCS

All vendor-produced documentation may be ordered through the UTCS Information Office, Room 201, 4 Bancroft Avenue. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call Dale Wright at 978-4990. Whenever feasible, documents are made available online, and users are encouraged to print their own copies. On the VM machine, a special command has been provided for this purpose.

To print online documents on:

IBM VM/CMS	**GP UNIX**
Type "help document"	Use *lpr* command

The following examples relate to the table below. The document to be printed is the UTCS Guide to Census Tapes, called CENSUS LISTING on CMS and /usr/doc/utcs/census on GP UNIX. <RETURN> means RETURN or ENTER key.

```
CMS:      document <RETURN> <RETURN>
          laser census listing (forms yxle <RETURN>

GP UNIX:  nohup lpr -8p -fyxle /usr/doc/utcs/census & <RETURN>
```

UTCS Documents in hardcopy

New:

Previously announced:

Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics
UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Catalogue: Text Products
UTCS Guide to Census Tapes
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online

	CMS LISTING	GP UNIX	Forms Code
New:			
Previously announced:			
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2		/usr/doc/utcs/access2	*
UTCS Catalogue: Numerical Products	NUMCAT		*
Product-Function List	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT		*
Product-Function List	STATLIST		BXQD
UTCS Catalogue: Text Products	TEXTCAT	/usr/doc/utcs/textcat	*
UTCS Guide to BMDP	BMDP		*
UTCS Guide to Census Tapes	CENSUS	/usr/doc/utcs/census	*
Recipes for Using Tapes on VM/CMS	QUIKTAPE		*
UTCS Guide to FORTRAN on VM/CMS	FORTRAN		*
UTCS Guide to GP UNIX		/usr/doc/utcs/gpunix	*
UTCS Guide to Highspeed Printing	PRINT	/usr/doc/utcs/print	*

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Documents continued

UTCS Documents online continued

	CMS LISTING	GP UNIX	Forms Code
UTCS Guide to Kermit	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to Micro Laser Printing Service	MICRLASR		*
UTCS Guide to SAS	SAS		*
UTCS Guide to SCRIBE	SCRIBE		*
(For printing instructions, see page 1 of document)			
UTCS Guide to Series/1 Terminal Use	SERIES		*
3270 Emulation:			
Cybernex APL100 and Volker Craig VC404	CYBER		*
DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY		*
IBM 3101	IBM3101		*
IBM PC Kermit	PCKERMIT		*
SOROC IQ	SOROC		*
VT52	VT52		*
VT100	VT100		*
UTCS Guide to SPSS	SPSS		*
UTCS Guide to Text Processing on GP UNIX		/usr/doc/utcs/text	YXOG
UTCS Guide to TFW.MAK in SCRIBE	TFWMAK		*
UTCS Guide to VM/CMS	CMSGD		*
UTCS Guide to WSCRIPT	WSCRIPT		*
UTCS Rate Schedule (Commercial)	RATESCOM		†
UTCS Rate Schedule (External)	RATESEXT		†
UTCS Rate Schedule (Internal)	RATESINT		†

Other Documentation online

Electronic Mail			
A User's Guide to Electronic MAIL	MAILBOOK		YXOC
Kermit			
Kermit Protocol Manual	KERMITPM		YXOE
Kermit User Guide	KERMITUG		YXOF
ProComm			
ProComm Reference Manual	PROCOMM		YXOE
VMBATCH Documents			
VMBATCH User's Guide	VMBATCH		YXOA
VMBATCH Messages and Codes	VMBATMC		YXOA
VMSECURE			
VMSECURE User's Guide	VMSECURE		YXOE
VM Tape Documents			
TapeMap User's Guide and Reference	TAPEMAP		*
VMTAPE Messages and Codes	VMTMSGS		YXOE
VMTAPE User's Guide	VMTUSER		YXOE
Waterloo SCRIPT			
Reference Manual	WSCRPTRF		YXLC
User's Guide	WSCRPTUG		YXLC
Using SCRIPT in MVS/TSO	WSCRPTSO		YXLC
Waterloo SCRIPT and a PostScript Printer	WSCRPTPS		YXLC
Formula Processor Summary	WSCRPTFP		YXLC
GML User's Guide	GMLUG		YXLC
GML Reference Summary	GMLRFSUM		YXLC

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	BC214	978-7109
External Marketing Consultant	Ihor Prociuk	BC217	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Information Office	Dale Wright	BC201	978-4990
Account & Access Code Enquiries)	Sylvia May	BC101B	978-7148
IBM PC Maintenance	Kam Mark	BC103	978-5050
Tape Library (Academic Services)	Susan Kovago	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Terminal Service	Rosi Tseu	BC105	978-7087
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, and GP UNIX userids:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-3959
Interactive Services 1200 (bps)	978-3959
Interactive Services 2400 (bps)	978-7239

UTCS Directory

Director:	Dr. Warren Jackson	BC118	978-8948	wcj@vm.utcs.utoronto.ca
Associate Director:	Eugene Siciunas	BC116	978-5058	eugene@vm.utcs.utoronto.ca
Managers:				
Communications &Technical Support	Norman Housley	BC121B	978-4967	norman@vm.utcs.utoronto.ca
Information Centre	Don Gibson	BC217	978-7331	don@vm.utcs.utoronto.ca
Internal Systems Support	Ron Vander Kraats	BC121A	978-4428	rvk@vm.utcs.utoronto.ca
Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP331	978-3579	bill@vm.utcs.utoronto.ca

Committees on Computing

Committee on Administrative Computing	Chair	Janice Oliver	978-4322
UTCS Board	Chair	Prof J.F. Keffer	978-4984
Supercomputer Users' Group at U of T	Chair	Prof. J.M. Ting	978-4971
Research Board Standing Committee on Computing	Chair	Prof. C.C. Gotlieb	978-2986

Legend

BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

*** NetNorth/BITNET/EARN**

UTCS Terminal and Advising Sites

Names and Locations

Central Advising Office (CAO), 978-HELP
Engineering Annex (EA, CDF), 11 King's College Road, Rooms 103, 107, 107B, 201, 203
Erindale College (Erin), 828-5339, Mississauga Road, Erindale Campus, Rooms 2037, 2039A-B-C, 2045
Robarts, Robarts Library, 130 St. George St., Room 1061A
Sidney Smith (Sidney), 100 St. George St., Rooms 1071, 2105
St.Michael's College, 121 St. Joseph St., Room 107
Trinity College, 6 Hoskins Ave., Room 024
Victoria University, 73 Queens Park Cres., Room 208

Access Hours

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2039)∆	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045-46-47)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235)†	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St.Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	978-HELP for Research
Victoria	8:30-21:00	8:30-21:00	8:00-13:00	8:00-13:00	None	978-HELP for Research

Sites	Advising Hours
CAO	Monday through Friday, 10:00 - 18:00
Erin	Monday through Friday, 09:00 - 22:00

Legend

- * Research includes graduates, faculty, staff.
- ∆ Key access available.
- † Access restricted to building hours.

Terminal and Printer Access

Sites	PACX	Network Terminal Server	Printers	CDF/PC Terminals
CDF	N	N	Y	N
EA	Y	N	Y	N
Erin	Y	Y	Y	N
Robarts	Y	N	Y	Y
Sidney	Y	N	Y	Y
St.Michael's	Y	N	Y	Y
Trinity	Y	N	Y*	Y
Victoria	Y	N	Y*	Y

(Y=yes, N=no)

* CDF/PC only

UTCS Services

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS

- General Purpose Timesharing, access to NetNorth, BITNET, and EARN networks; access to the Internet
- 4381 P02 processor, 32 megabytes of memory
- CP operating system, VM/SP HPO R4.2
- CMS timesharing system, VM/SP Release 4
- RSCS spooling system, Release 3

GP UNIX
Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotronic typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks worldwide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET

Services

Communications & Technical Support
Primary Phones: 978-3787, 978-4967

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs, Micro Vaxes, and Macintoshes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; ONET, the Ontario Regional Network; and USENET, the UNIX networking fraternity
- provides gateway to the US Internet
- will provide a communications solution to department needs on a contractual basis

Information Centre
Primary Phone: 978-HELP

- Provides assistance in use of electronic messaging, including use of Local Area Networks (LANS); NetNorth/BITNET/EARN, the world Universities network; CDNNET, the Canadian X.400 network; ARPANET; CSNET; USENET; and other international connections.
- provides advising, consulting and documentation on:
  - command languages, including CMS and UNIX
  - high level languages, including FORTRAN, and PL/I
  - packages and libraries, including SAS, SPSS-X, BMDP, IMSL, and NAg
  - editors and formatters, including XEDIT, ed, nroff/troff
- provides general micro support
  - selection consulting for hardware and software
  - Micro Lab for evaluation of hardware and software
  - advice on University discounts
  - media conversion and data transfer
  - operates UTCS Microcomputer Bulletin Board System
  - offers Micro Laser Printing Service
  - offers 35mm slide production service using Polaroid Palette
  - administers Local Area Network of PCs for Education Facility
  - administers Macintosh Education Facility
- high quality typesetting
- installs and maintains application packages
- provides short courses and seminars on the more popular services and software packages

> *The mandate of UTCS is to encourage and support the use of information technologies across campus, and to plan, implement, and operate common-carrier networks and certain appropriate central computer facilities.*

Facilities Managed by UTCS

Administrative Computing

- administrative IMS, DB2, Batch, and TS0
- 3081K processor, 48 megabytes of memory
- MVS/XA operating system

Computer Disciplines Facility/UNIX

SUN 3/280s, 8 megabytes of memory (zero.cdf)
- Computer Science interactive access
- SUN UNIX 3.5

SUN 3/280s, 16 megabytes of memory (one.cdf)
- Computer Science interactive access
- SUN UNIX 3.5

Computer Disciplines Facility/PC

- 97 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Erindale College Systems

VAX 8200, 8 megabytes of memory
- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory
- instructional access using UNIX (Berkeley UNIX 4.3BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory
- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Ontario Centre for Large Scale Computation (OCLSC)

- Cray Research Inc. X-MP/24
- 2 processors, 4 megawords main memory
- solid state disk (SSD) with 64 megawords of storage
- COS 1.17 operating system
- VAX 8350 + MicroVAX II and VAX750 provide VMS front-end services

Software List

SOFTWARE LIST for MICROCOMPUTERS

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the Academic's Guide to Microcomputer Systems.

Package/Compiler	Version	Environment	Support
Application Development Tools			
Assembler			
Microsoft Assembler	5.1	MS-DOS 3.3 & OS/2	B
MPW Assembler	2.0.2	Macintosh	B
BASIC			
GW BASIC	—	MS-DOS	B
C			
Microsoft C	5.1	MS-DOS	B
MPW C	2.0.2	Macintosh	B
WATCOM C & Express C	6.0	MS-DOS	B
FORTRAN			
IBM FORTRAN/2	1.0	MS-DOS 3.3 & OS/2	B
Language Systems FORTRAN	1.0	Macintosh	C
Microsoft FORTRAN	4.0	MS-DOS	B
WATCOM WATFOR-77	3.0	MS-DOS	A
Pascal			
MPW Pascal	2.0.2	Macintosh	C
TURBO Pascal	—	MS-DOS	B
Tools			
ResEdit	1.2d0	Macintosh	B
HyperCard	1.2.1	Macintosh	A
Macintosh Programmer's Workshop	2.0.2	Macintosh	B
WATCOM GKS	1.3	MS-DOS	B
Communications			
File Transfer & Terminal Emulators			
Kermit	0.8(35)	Macintosh	A
Kermit	2.30	MS-DOS	A
Kermit	—	Apple II DOS	C
Kermit	—	CP/M	C
DeskLink	2.21c	MS-DOS	B
Lap-Link Mac	2.0	Macintosh	B
Lap-Link PC	2.16	MS-DOS	B
MacTerminal	2.2	Macintosh	B
PC TALK3	—	MS-DOS	C
PC PLOT III	—	MS-DOS	C
ProComm	TU 2.4.2	MS-DOS	A
Red Ryder	10.3	Macintosh	B
Remote^2	1.01	MS-DOS	B
Network Systems			
AppleShare	2.0.1	Macintosh	B
Novell Advanced Netware	2.0a	MS-DOS	B
STARLAN	3.1	MS-DOS	B
TOPS	2.1	Macintosh	B
TOPS	2.1	MS-DOS	B
Network System Utilities			
Inter•Poll	1.0	Macintosh	B
Database Managers			
4th Dimension	Int. 1.03	Macintosh	B
Archivist	1.02b	MS-DOS	B
AskSam	3.03	MS-DOS	B
Clipper	S87	MS-DOS	B
DATAEASE	2.5R3	MS-DOS	B
dBASE IV	1.0	MS-DOS	A

Software List continued

Package/Compiler	Version	Environment	Support
FoxBASE Mac	2.0	Macintosh	B
Notebook II	2.03	MS-DOS	C
Desktop Publishing			
Fontographer	n/a	Macintosh	C
PageMaker	3.01	Macintosh	A
PageMaker	3.0	MS-DOS	A
Ready Set Go	4.0	Macintosh	C
Ventura	2.0	MS-DOS	B
XPress	1.0	Macintosh	C
Electronic Mail			
Microsoft Mail	1.36	Macintosh	B
QuickMail	1.0	Macintosh	B
Graphics			
Charting			
35mm Express	4.02	MS-DOS	B
Cricket Graph	1.2	Macintosh	C
Freelance Plus	3.0	MS-DOS	B
Harvard Graphics	2.1	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
SigmaPlot	—	MS-DOS	C
Draw and CAD			
Aldus Freehand	1.0	Macintosh	B
Cricket Draw	1.1	Macintosh	C
Generic CADD	3.0	MS-DOS	C
MiniCad	4.05	Macintosh	C
Illustrator	1.0	Macintosh	B
Illustrator88	1.6	Macintosh	B
MacDraft	1.2b	Macintosh	C
MacDraw	1.95	Macintosh	A
MacDraw II	1.0v1	Macintosh	B
Windows Draw	1.02	MS-DOS	C
Image and Scanning			
Corel Draw	1.00	MS-DOS	B
ImageStudio	1.05	Macintosh	B
Publish Pac	2.0	Macintosh	B
Publish Pac	2.1	MS-DOS	B
Text Pac	2.0	MS-DOS	B
Paint			
DR HALO	1.23	MS-DOS	C
MacPaint	2.0	Macintosh	A
Microsoft Paintbrush	2.0	MS-DOS	C
PC Paintbrush	2.5	MS-DOS	C
SuperPaint	1.1	Macintosh	B
Windows Paint	2.03	MS-DOS	C
Plotting Subroutines			
WATCOM GKS	1.3	MS-DOS	B
Numerical			
Derive	1.14	MS-DOS	C
Eispack	n/a	MS-DOS	C
Eureka	n/a	MS-DOS	C
GAUSS	2.0	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
Linpack	n/a	MS-DOS	C
MathCAD	2.0	MS-DOS	C
muMATH-83	4.12	MS-DOS	C
NAg Workstation Library	Rel. 1	MS-DOS	A
Solver-Q	---	MS-DOS	C
Operating Systems			
IBM PC, PS/2, and compatibles			
AIX PS/2 (Unix)	1.1	n/a	C
IBM OS/2 Extended	1.1	n/a	B
IBM PC-DOS	4.0	n/a	B
Microsoft MS-DOS (incl IBM PC-DOS)	3.3	n/a	A
Microsoft Windows 286	2.1	MS-DOS	A
Microsoft Windows 386	2.1	MS-DOS	A
Macintosh II, Macintosh SE, and Macintosh Plus			
A/UX (Unix)		n/a	C
Finder	6.1	n/a	A
MultiFinder	6.0.1	n/a	A
System	6.0.2	n/a	A
NeXT			
NeXT	0.9	n/a	B
Apple II			
Apple II DOS	3.3	n/a	C
CP/M	2.20	n/a	C
ProDos	1.0	n/a	C
Sound			
SoundWave	1.0	Macintosh	B
MacRecorder	1.0	Macintosh	B
Spreadsheet			
HAL	1.0	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
Statistical			
BASS	88.10	MS-DOS	C
MACSPIN	1.5	Macintosh	C
Minitab	82.1.1	MS-DOS	C
PowerStat	1.04	MS-DOS	C
SAS/PC	6.03	MS-DOS	A
SPSS/PC+	3.0	MS-DOS	A
STATPRO	2.0c	MS-DOS	C
STATWORKS	1.2	Macintosh	B
SYSTAT	3.2	Macintosh	B
SYSTAT	3.2	MS-DOS	B
Word Processing			
Guide	2.0	MS-DOS	C
FinalWord II	2.0	MS-DOS	C
MacWrite	5.01	Macintosh	B
Manuscript	2.0	MS-DOS	C
Microsoft Word	3.01	Macintosh	A
Microsoft Word	4.0	MS-DOS	A
Nota Bene	3.0	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
Nota Bene SLS	3.0	MS-DOS	B
PC-TeX	2.1	MS-DOS	B
Sprint	1.0	MS-DOS	B
T^3	—	MS-DOS	C
WordPerfect	4.2 & 5.0	MS-DOS	A
WordPerfect	1.0	Macintosh	C
WordPerfect Library	2.0	MS-DOS	C
WordStar	3.3	MS-DOS	C
Utilities			
Apple Turnover	—	MS-DOS	A
Fastback MAC	2.0	Macintosh	B
Fastback Plus	2.0	MS-DOS	B
Norton Utilities	4.5	MS-DOS	A
Copy II MAC	7.2	Macintosh	B
Mace Utilities	4.10	MS-DOS	B
MacZap	5.1	Macintosh	B
Sidekick	—	MS-DOS	C
TURBO Lightning	—	MS-DOS	C
XenoCopy PC	1.117	MS-DOS	A

Software List continued

SOFTWARE LIST for MAINFRAME COMPUTERS VM/CMS, UNIX

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support.

For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction.

Package/Compiler	System	Support	Version
Communications			
Kermit	VM/CMS	A	---
Kermit	UNIX	B	4C(058)
FTS	VM/CMS	A	---
MAIL/MAILBOOK	VM/CMS	A	86.359
MICROLASER	VM/CMS	A	---
macget/macput	UNIX	C	---
netcopy, netexec, to (NetNorth Tools)	UNIX	B	---
xmodem	UNIX	C	---
ftp,rsh,rlogin,telnet,rcp (Access via TCP/IP to most of the networked machines on all three campuses)	UNIX	B	---
rn/Pnews	UNIX	B	---
mail,mh,Mail	UNIX	-	---
Graphics			
PLOTBASIC (FORTRAN)	VM/CMS	C	---
SAS/GRAPH	VM/CMS	A	5.16, 5.18
Languages			
ASSEMBLER(F)	VM/CMS	C	---
Concurrent Euclid	VM/CMS	C	1.9
FORTUTILS	VM/CMS	A	2.2
PL/I OPT Compiler	VM/CMS	B	1.5.1
REXX	VM/CMS	A	---
SNOBOL 4	VM/CMS	C	3.5
Turing	VM/CMS	C	---
VS FORTRAN	VM/CMS	A	1.4.1
VS Pascal	VM/CMS	C	2.2
Waterloo C	VM/CMS	C	1.3
WATFIV	VM/CMS	C	V2L0
WATFOR-77	VM/CMS	A	1.3
cc	UNIX	A	---
f77	UNIX	C	---
ratfor	UNIX	C	BSD std.
ttc	UNIX	C	---
pc	UNIX	C	BSD std.
yacc	UNIX	C	---
awk	UNIX	C	---
adb,dbx	UNIX	C	BSD std.
Numerical			
IMSL	VM/CMS	A	9.2,10.0
LINPACK	VM/CMS	C	---
MINOS	VM/CMS	C	5.1
MINPACK	VM/CMS	C	---
NAg	VM/CMS	A	Mark 11
Statistical			
BMDP	VM/CMS	A	Level 85, Level 87
Minitab	VM/CMS	B	5.1
NAg	VM/CMS	A	Mark 11
NTSYS	VM/CMS	C	1987
SAS	VM/CMS	A	5.18
SPSS^x	VM/CMS	A	2.2

Software List continued

Package/Compiler	System	Support	Version
Text Processing			
SCRIBE	VM/CMS	C	4(1400)-1
Waterloo SCRIPT	VM/CMS	B	86.1
XEDIT	VM/CMS	A	---
8700 Pseudotypesetting	VM/CMS	C	n/a
MICROLASER	VM/CMS	A	---
ed	UNIX	A	---
vi	UNIX	C	---
cmacs	UNIX	C	---
spell	UNIX	C	---
diction/explain	UNIX	C	---
eqn	UNIX	B	---
tbl	UNIX	B	---
pic	UNIX	C	---
troff	UNIX	B	---
nroff	UNIX	B	---
TeX	UNIX	C	---
Utilities			
FORTUTILS	VM/CMS	A	2.2
TPRINT	VM/CMS	C	---
crypt	UNIX	A	BSD std.
compress	UNIX	C	BSD std.
csh	UNIX	B	BSD std.
diff	UNIX	A	BSD std.
grep	UNIX	A	BSD std.
ipr	UNIX	B	---
learn	UNIX	C	BSD std.
patch	UNIX	C	---
sed	UNIX	A	BSD std.
sort	UNIX	A	BSD std.
sh	UNIX	A	BSD std.
tar	UNIX	A	BSD std.
uniq	UNIX	A	BSD std.

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